



GPM Global
Precipitation
Measurement



CEOS Precipitation Constellation

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CEOS

- ❁ Committee of Earth Observation Satellites (CEOS) is the primary coordination body for the space segment of GEOSS.
 - ❁ 25 members and 20 associates
- ❁ CEOS promotes the following three activities to implement the space segment of GEOSS;
 - ❁ CEOS response to GCOS Implementation Plan to be submitted to COP12 (Nov 2006, Nairobi)
 - ❁ GEOSS 2006 Work Plan, 2007-2009 Work Plan
 - ❁ CEOS long-term plan

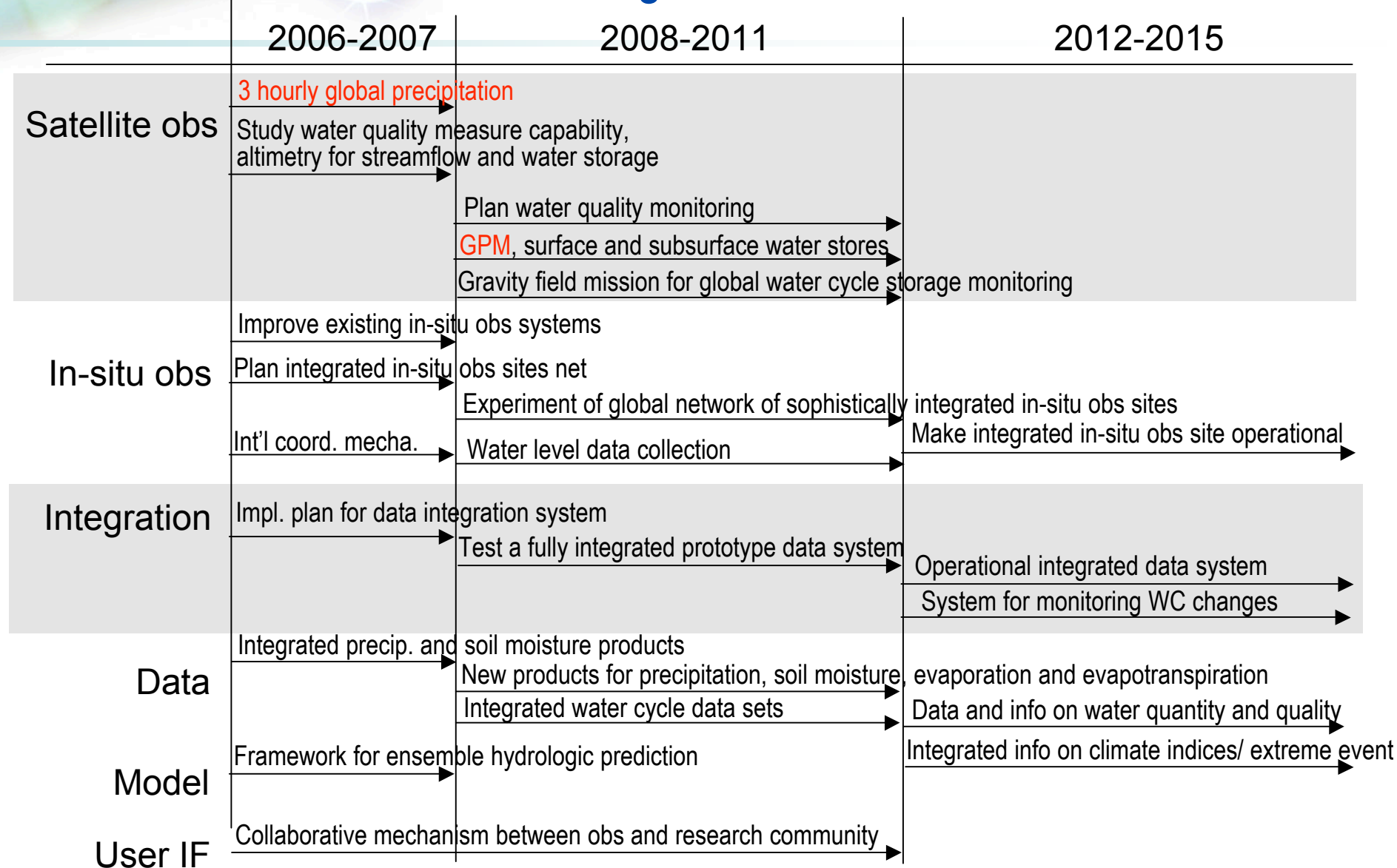


GEOSS

- ❁ GEOSS 10 year Implementation Plan was adopted at the 3rd Earth Observation Summit (Feb 2004, Brussels)
- ❁ 9 Societal Benefit Areas are defined for applications of EO data and information
 - ❁ Improving water resource management through better understanding of the water cycle
- ❁ 2 year, 6 year and 10 year targets are defined for the GEOSS implementation
 - ❁ *“Facilitate, with space agencies and research communities, more accurate, frequent(3-hourly), global, high spatial resolution, and micro-physically detailed measurements of precipitation through a global constellation of satellites carrying passive microwave radiometers in complementary orbits.”*



Time series of GEOSS IP Targets - Water





CEOS long-term plan

- ❁ Adopt the CEOS Constellations Concept as the foundation for the new co-ordination process
 - ❁ Intensive development of several prototype Constellation studies in the immediate future
 - ❁ Further (parallel) development of the Concept and process
- ❁ Very proactive engagement of agencies and agency Heads relevant to the prototype Constellations
 - ❁ Propose a letter to Heads co-signed by: current & future CEOS & SIT Chairs for the next 18 months emphasising the importance of attendance at SIT-19&20
 - ❁ Linkage to agency planning and budgets essential for success



CEOS Constellation Concept

- ❁ To define “Constellation” would be the focus for the planning and coordination by CEOS agencies; the definition would serve as a guide to all agencies as to the characteristics of the space and ground segment for their mission which would best satisfy the needs of the agreed users.
- ❁ At the heart of the application of the Constellation concept is the definition of a series of standards – required to be satisfied for a mission to be included in the constellation – and a process of recognition/acceptance, whereby an agency applies to CEOS to have one or more of their missions and thereby satisfying the relevant user community needs.
 - ❁ Measurement standards (spatial, spectral and radiometric performance)
 - ❁ Technical specifications for inter calibration (with other spacecraft in the constellation and with ground systems) and definition of common calibration practices
 - ❁ Technical specifications for data format and inter-operability of data acquisition and distribution networks
 - ❁ Agreement on some general principles of data policy



GPM
Global Precipitation Measurement



Suggested Candidates (and Study Leads)

Ocean Surface Topography

NOAA&EUMETSAT, ESA, CNES,
ISRO, NASA

*Sustaining a fundamental climate data record for
global sea level and ensuring continuity of service to operational and
research users*

Land Surface Imaging

USGS + Multiple CEOS agencies

*Ensuring continuity of key land surface observations
– including Landsat-class observations – for multiple GEOSS Societal
Benefit Areas, including Agriculture.*

Precipitation (GPM)

CAST/NRSCC, ESA, NASA and JAXA...

*Addressing Task AR-06-10 of the
GEOSS 10 Year Implementation Plan*

Atmospheric Chemistry

NASA + Multiple CEOS agencies

*Contributing multiple Fundamental Climate Data
Records to GEOSS Task CL-06-02*

Other candidates could include:
SAR Constellation for Disasters; SST, Sea-ice etc



GOALS OF THE PRECIPITATION CONSTELLATION (From SCOPING PAPER)

- ❁ To provide a framework for implementation and monitoring of GEO 2006 Work Plan task (AR-06-10)
 - ❁ *Advocate and facilitate the timely implementation of the Global Precipitation Measurement (GPM) mission and encourage more nations to contribute to the GPM constellation*
- ❁ To initiate and sustain an accurate and timely global precipitation data record including a Fundamental Climate Data Record essential for understanding the integrated weather/climate/ecological system, managing freshwater resources, and monitoring and predicting high-impact natural hazard events.



PARTICIPATION (AND CONTACTS)



Study Lead agencies:

- Japan - JAXA (Riko Oki, oki.riko@jaxa.jp) & USA - NASA (Steven Neeck, steven.neeck@nasa.gov)



Space agency participants:

- France - CNES: Didier Renaut, didier.renaut@cnes.fr (To be confirmed)
- India - ISRO: Raju Garudachar, raju_garudachar@hotmail.com (To be confirmed)
- Brazil - AEB: Raimundo N. Fialho Mussi, mussi@aeb.gov.br (To be confirmed)
- Europe - ESA: Einar-Arland Herland, einar-arland.herland@esa.int
- China - CAST/NRSCC: Point of contact (confirmed)
- USA - NOAA: Ralph Ferraro, ralph.r.ferraro@noaa.gov (To be confirmed)
- Europe - EUMETSAT: Johannes Schmetz, Johannes.Schmetz@eumetsat.int (To be confirmed)
- Canada - Canadian Space Agency: Point of contact (To be confirmed)



PARTICIPATION (AND CONTACTS)



User community representatives:

Per the guidance provided in the CEOS Constellations Concept paper, the Precipitation Constellation will engage key participants from the major stakeholder user communities and will make best use of past requirements definitions – including the extensive body of work available within the IGOS Global Water Cycle Observations Theme report, and the recent GCOS Satellite Supplement.



WCRP/IGWCO: Dr R. Lawford, lawford@umbc.edu



CGMS-IPWG: Dr. F. Joseph Turk, turk@nrlmry.navy.mil



Dr. Peter Bauer, Peter.Bauer@ecmwf.int



GCOS: TBC









Scope of Study









- ❖ The Constellation study will aim to **identify the key points of agreement** which will be required to ensure the user benefits from the space agency co-operation are realised in practice. These agreements can be expected to address:
 - ❖ the framework and systems for data and product access and exchange;
 - ❖ arrangements for interoperability in data, products and services;
 - ❖ inter-operability in data processing, archiving and dissemination,
 - ❖ space-segment commonalities including sensor specification and satellite system specifications (data transmission, orbit, etc.)
- ❖ The approach will be results-focused, **identifying what steps are necessary** by space agencies (and other groups responsible for product generation, in-situ observations etc) **to develop the target data sets and information services.**

Current Plan

Dedicated precipitation missions

-  The TRMM spacecraft, launched in 1997, developed and operated by NASA and JAXA
-  The GPM Core Spacecraft, due for launch by 2013, developed by NASA and JAXA
-  The GPM Constellation Spacecraft, due for launch by 2014, developed by NASA
-  The GPM-Brazil (GPM-Br) satellite, to be developed by AEB
-  Other appropriate international satellites carrying microwave sensors
-  Follow-ons to the above missions

Supporting missions

-  The NASA Aqua spacecraft, launched in 2002, carrying the JAXA AMSR-E microwave instrument
-  The Megha-Tropiques satellite carrying the MADRAS microwave sensor, due for launch in March 2009, developed by CNES and ISRO
-  The GCOM-W satellite, carrying the AMSR F/O, due for launch in 2011 and developed by JAXA
-  The POES, DMSP and NPOESS satellites carrying the AMSU-B, SSMIS, ATMS, and MIS microwave sensors developed and operated by the US Integrated Program Office
-  The METOP satellites carrying the MHS microwave sensor developed and operated by EUMETSAT
-  ESA future LEO, GEO sounder/imager
-  Other appropriate international satellites carrying microwave sensors
-  Follow-ons to the above missions

Study Approach (SCOPING PAPER)

1. defining what the value added from the Precipitation Constellation could be – in terms of a Fundamental Climate Data Record, or sustained information service(s) for societal benefit – driven by user requirements;

For that purpose, the scope of the study will cover;

- ❁ Develop a consensus for priorities based on user requirements,
- ❁ Establish how existing and approved missions could work more synergistically to meet user requirements and GEOSS SBAs,
- ❁ Determine inconsistencies or deficiencies, and reconcile differences,
- ❁ Evaluate existing and upcoming missions, both research and operational, and compare with requirements
- ❁ Define enhancements in the areas of cal/val, quality control, and data accessibility and interoperability,
- ❁ Define enhancement in the areas of precipitation estimation methods and estimation accuracy
- ❁ Develop the rationale and strategy for future missions to meet unmet requirements. The strategy will potentially include architecture, schedule, and cost.



Study Approach (SCOPING PAPER)

2. ascertaining whether there is sufficient consensus amongst those agencies with resources
3. defining the 'key points of agreement' regarding each stage of the Precipitation Constellation.

We plan to define:

- scientific requirements for the measurement being undertaken. This will provide guidance regarding minimum requirements for sensor specifications;
- technical specifications for inter-calibration and definition of common calibration practices;
- technical specifications for the data format and inter-operability of the data acquisition and distribution networks;
- agreement on some general principles of data policy.

4. preparing an Implementation Plan, comprising actions, targets and milestones for the realisation of the Precipitation Constellation



Schedule

- ❁ Study for one year → Implementation Plan
- ❁ Constellation study will be consolidated through GPM international workshops and regular teleconferences among participating agencies
 - ❁ GPM international workshop, A n n a p o l i s , Nov 2006
 - ❁ GPM international workshop, TBD, Autumn 2007
- ❁ Progress report to SIT-20 and SIT-21 and final report to CEOS Plenary 21 in 2007



Back-up slides



WSSD

World Summit on Sustainable Development (WSSD, August 2002 Johannesburg) Plan of Implementation

- ❁ “27. *Improve water resource management and scientific understanding of the water cycle through cooperation in joint observation and research*, and for this purpose encourage and promote knowledge-sharing and provide capacity-building and the transfer of technology, as mutually agreed, including remote-sensing and satellite technologies, particularly to developing countries and countries with economies in transition.”
- ❁ “36(h) Enhance the implementation of national, regional and international strategies to monitor the Earth’s atmosphere, land and oceans including, as appropriate, *strategies for integrated global observations*, inter alia with the cooperation of relevant international organizations, especially the United Nations specialized agencies in cooperation with the UNFCCC;”



3rd World Water Forum

3rd World Water Forum (March 2003, Kyoto) Ministerial Declaration

“12. We will further encourage scientific research on predicting and *monitoring the global water cycle*, including the effect of climate change, and develop information systems that will enable the sharing of such valuable data worldwide. “



IGWCO

- ❖ Integrated Global Water Cycle Observation (IGWCO) Theme was established by the Integrated Observing Strategy Partnership (IGOS-P) in Nov 2001
- ❖ IGWCO Theme report was generated by a writing team co-chaired by WCRP and CEOS (JAXA)
- ❖ IGWCO Theme report strongly support the Global Precipitation Measurement (GPM) mission.



Targets: 2006

❁ SIT-19 (Sep 19-20, 2006):

- ❁ Presentation of CEOS Constellations Process Paper v0.1
- ❁ Preliminary proposals for each prototype Constellation
- ❁ Confirm selection for further development and identify lead agency in each case
- ❁ Firm engagement of relevant agency heads

❁ Plenary-20 (Nov 2006):

- ❁ Confirm membership of each prototype Constellation study team
 - ❁ Study Lead/ Space agencies/ User community representative(s) – inc GEO SEC
- ❁ Presentation of CEOS Constellations Process Paper v0.2
- ❁ Agree 2007 timetable for prototype studies (intensive)



GEOSS



GEOSS 2006 Work Plan has a task

“AR-06-10”



“Advocate and facilitate the timely implementation of the Global Precipitation Measurement (GPM) mission and encourage more nations to contribute to the GPM constellation”



AR-06-02 is implemented by co-lead organizations of NASA and MEXT/JAXA